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Dissecting the Big Oil versus Cap-and-Trade Rivalry in California

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I. Introduction

Enhanced regulatory authority exercised by US state governments has resulted in disparate laws across states related to tax rates, drug policies, and laws affecting personal liberties, among other political issues. This has also resulted in stringent environmental legislation in some areas and lax or nonexistent regulation in others, prompting inconsistent pollution regulations. One innovative approach to limiting emissions is the cap-and-trade program in California. In the past, the oil industry in California has been too powerful to be hampered by state-level regulations, and lawmakers have historically failed to thwart the power of "Big Oil". However, a whirlwind of recent events has prompted the expansion of cap-and-trade to the oil industry.

While cap-and-trade has overwhelmingly been deemed a success in limiting greenhouse gas emission as well as in earning revenue for the state, its effect on oil organizations has not been analyzed on a macro level. The changes in productivity in the California oil sector as it relates to changes in pollution since the expansion of cap-and-trade merits an analysis.

II. Literature Review and Background

In recent years, greater regulatory responsibility in numerous lawmaking areas in America has moved from the federal government to state governments (Altshuler & Luberoff, 2003). Donovan et al. (2009) indicated that local and state governments currently have a greater impact than the federal government on the daily lives of Americans. This is the result of a new phenomenon known as the devolution revolution, in which American state governments have established or reestablished themselves as powerful entities capable of spending time and effort on specific regulations and policymaking (Gerber & Teske, 2000). In particular, this enhanced state-level clout has resulted in varying levels of environmental legislation and regulation (Sapat, 2004; Daley et al., 2007). Potoski and Woods (2002) surmised that since environmental policy is now situated at the state level, non-uniform air pollution regulations and lower air quality standards have resulted.

The US state of California has been at the forefront of state-level discourse regarding environmental regulations within the oil industry over its history (Williams, 1997; Thompson, 2014). California enacted Assembly Bill 32, which led the California Air Resources Board to adopt cap-and-trade, a comprehensive regulation of industrial organizations in California that use coal. This act officially took effect on January 1, 2013 (Schmalensee & Stavins, 2015). Under a cap-and-trade model, a government-issued cap sets a maximum allowable level of pollution and penalizes companies that exceed that emission allowance (EDF, 2017). The California state government determines the mandated maximum amount of pollution emissions that applicable industrial organizations can emit annually, with a more stringent allowance every year. An organization may gain emissions allowances/permits for polluting at annual rates under the cap and then sell them through auctions in the open market or bank them and use those allowances in the future to cover their own emissions (Bushnell, 2008).

Although this model has been used internationally, the cap-and-trade process in California has been called the US's "first economy-wide market trading system" to limit coal-based pollution (Gallagher, 2012, p. 602), and AB32 has been labeled "the state's overarching climate law" (Sperling & Nichols, 2012, p. 65). Cap-and-trade was designed to regulate coal-powered energy because carbon dioxide (the major form of greenhouse gas pollution) constitutes 35% of all US energy emissions, with coal-powered energy usage comprising 68% of that total. Since implementation, the system has been deemed a success in part because it motivates organizations to make technological innovations to limit carbon emissions: "if allowances are very expensive, the utility will be incentivized to make more expensive investments rather than risk having to buy additional allowances" (Cook, 2013, p. 16). As such, the price of the carbon credits is directly impacted by the general costs of decreasing industrial emissions rates. Through May of 2015, private sector auctions for carbon credits earned California over $2 billion in revenue, which the state reinvested in clean air initiatives (Schmalensee & Stavins, 2015, p. 12). In addition, regulated emissions dropped by 4% (EDF, 2016; Fehrenbacher, 2017).

Fuels such as gasoline, diesel, and natural gas were not originally covered under this act. However, as observers have deemed cap-and-trade a success, an increasingly vocal coalition has advocated that the oil industry in California also be subject to the standard cap-and-trade provisions since 2014 (Clarke, 2014; McGuinty, 2015). These constituencies objected that since oil is also a major contributor to greenhouse gas pollution, like the carbon/coal industry, this fossil fuel should also be subject to cap-and-trade.

87% of carbon dioxide emissions come from the burning of fossil fuels, whereas 43% come from coal and 36% come from oil (Renewable Energy, 2017). The oil/natural gas sector is the second-highest contributor of greenhouse gases (behind coal) and emits 225 million metric tons of carbon dioxide-equivalent per year in the US. Plagakis (2013, p. 3) stated that "The latest data on greenhouse gas emissions clearly

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establishes that the oil and natural gas sector emit considerably more greenhouse gas pollution than previously believed".

However, some key constituencies stood to lose if the oil industry was added to California cap-and-trade, especially California oil organizations themselves. Nussbaum (2016) reported that an additional $3 billion per year in expenses would be spent by the oil industry if cap-and-trade were to be expanded to include oil. As a major actor in the overall California environmental regulations debate, the oil industry has been fighting this and similar industry regulations for decades. In fact, one of the reasons oil-related emissions were not included under the original cap-and-trade has been the power and influence of the oil industry. Because of the power it has and the victories it has accumulated, it has commonly been labeled "Big Oil" (Scott, 2017).

Big Oil has had a long history of battling the state of California when it comes to regulations in the industry. Surging oil production in California starting in the 1920s stimulated some legislative fallout in the early 1930s, when state lawmakers attempted to intervene, as many in the state at this time felt that the state government should be regulating the oil industry. However, the oil companies banded together and "industry cooperation" (Sabin, 2005, p. 154) successfully kept oil prices artificially high until the California state government, which had openly opposed oil drilling, suddenly embraced an extraordinary backroom deal to collaborate with the oil industry. This prompted a major victory for Big Oil, as oil organizations maneuvered to circumvent the law (Sabin, 2005). In the years thereafter, the state was never able to successfully reign in the oil companies, who have continued to overproduce in the absence of state government interference (Bing, 1951; Thompson, 2014). Williams (1997, p. 217) described the influence of the oil industry during the state's early stages of development: "Californians achieved energy abundance and independence in the first half of the twentieth century, which was an essential pre-condition to the state's emergence … Innovative efforts made oil's use as fuel almost universal on the Pacific Coast".

Big Oil has had not only a powerful historical influence in California, but also a history of wielding major influence on national energy policies (McBeath, 2016). Stoner (2013) stated that Big Oil has the ability to kill climate legislation in the US because of their "army of lobbyists" (p. 107). Big Oil has historically collaborated with Wall Street bankers and lawyers to influence climate policy and has exercised its power through lobbying and campaign contributions to politicians (McBeath, 2016; Scott, 2017).

Big Oil's influence has not been limited to the US, as it has also had an influence on the world's economies and economic policies for decades (McDonald, 1974). Increasing pressure by environmentalists and governments to regulate the industry has prompted Big Oil companies to compile massive resources to fight back, such as by making efforts to cover up their pollution record to enhance their image (Smith, 2015). Big Oil has even been said to have more power over world politics than governments (Nesbit, 2016; McQuaig, 2011) as well as economic hegemony along with the world's central banks through "dirty money" (Henderson, 2010), as the industry routinely spends billions of dollars to create positive brand images through marketing (Robinson, 2014).

For years prior to the cap-and-trade fight, the oil industry fought fiercely against proposed low-carbon fuel standards in California (Sperling & Nichols, 2012), then it spent millions on lobbying to oppose its addition to cap-and-trade in California. However, in 2009, Big Oil in California suffered its first major loss, as California lawmakers adopted a low-carbon fuel standard in a cap-and-trade styled approach, which allowed oil organizations to trade credits for decreasing emissions in the transportation fuel industry. This standard officially took effect in 2011 (Sperling & Nichols,2012). Barbose (2017) noted that even after this legislation passed, the "oil industry has consistently sought to undermine" the program (Barbose, 2017). As it relates to the low-carbon fuel standard, the oil industry has "spent millions of dollars lobbying for its repeal and fighting it in court" (Wang, 2016). It has been stated that Big Oil would influence California's climate policies for the worse as "Climate advocates worry about the kind of compromises (California Governor) Brown could make with Big Oil" (Buhl, 2016).

There have been mixed responses the new low-carbon fuel standards. Greenbiz (2009, p. 4) called the low-carbon transportation fuel legislation a "cornerstone of the state's broader effort to reduce greenhouse gas emissions". Wang (2016) noted that the low-carbon fuel regulation was "being closely watched nationwide" by the oil industry and other environmental groups. By 2016, "carbon allowances, trading at around $13 a metric ton, had added about 12 cents to the retail price of a gallon of gasoline" in California (Nussbaum, 2016). As a result of these price increases, consumer-advocacy groups were among the constituencies against this legislation (Clarke, 2014; Cox, 2017).

In the 30 months leading up to Big Oil being added to cap-and-trade, eight oil companies spent $34 million in lobbying for favorable provisions (Buhl, 2016, Mulkern, 2017). Nevertheless, after much struggle and debate, Big Oil and its allies lost, and starting on January 1, 2015, industrial energy sources such as gasoline, diesel and natural gas were added under the cap-and-trade program in California, even though the oil industry heavily influenced the specifics of the final legislation. As such, Big Oil would now be subject to cap-and-trade regulations (California Air Resources Board, 2017).

At that time, the California Air Resources Board (2017, para. 4) stated that the oil sector being under the thumb of those rules "ensures equity between sectors … reducing our dependence on oil and thus our exposure to volatile oil prices". Fehrenbacher (2017) called adding oil to cap-and-trade a "signature component of California's plan to cut emissions". By March of 2017, 449 California oil companies were said to be in compliance with the new regulations, putting 83 million emissions allowances up for sale on the market (Greenbiz, 2009). In July of 2017, the bill was extended through 2030 (McGreevy, 2017) prompting California Governor Brown to say that the extension enables a "decarbonized sustainable future" (Megerian, 2017).

The oil industry suffered yet another loss in a more recent battle with the state of California. A Chevron refinery fire in

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2012 and an ExxonMobil refinery fire in 2015, both in California, prompted the state to successfully adopt burdensome regulations aimed at preventing hazards and improving safety. These were adopted in 2017 and estimated to cost the oil industry $800 million per year (Gonzales et al., 2016).

Big Oil's recent losses in California underscore a turning point in the energy-sector's decades-long battle against regulation of its industry in that state, but the battles continue. Big Oil continues to spend money on the fundamental political debate against regulators within the energy industry (Koppelaar & Middelkoop, 2017). Historical studies of regulations on pollution show negative relationships between manufacturing productivity and regulations (Nivola, 2010; Managi, 2011). Simpson (2011), for instance, found that artificially high oil prices are not due to production issues but to "environmental regulations and other government controls" (p. 151). Further, environmental regulations have been blamed for inefficient electric utility productivity for decades (Gollop & Roberts, 1983; Gray, 1987; Weber & Domazlicky, 2001). Simpson (2011, p. 163) stated, "Oil producers and consumers are being suffocated around the globe under a mountain of government obstacles based on environmentalist and other statist restrictions". Consumer-advocacy groups also are mounting alliances with Big Oil. Scholars have noted that California's cap-and-trade program did not take into account consumer energy rates and had a negative impact on energy consumers (Farber, 2012; Clarke, 2014; Cox, 2017). Recent analysts point to increased energy rates because of environmental legislation (Kryzanek, 2010; Bakker & Francioni, 2016; Raymond, 2016). Big Oil is quick to point this out in the media and within government actors.

In light of the recent struggles of Big Oil with the state of California, the current strength of the industry and the effects of regulations on productivity should be analyzed as the oil sector faces big financial losses associated with cap-and-trade. The severity of these losses for Big Oil is unclear, not only for expenses associated with cap-and-trade, but also for the negative impact on productivity within the sector.

III. Data and Methodology

This study will examine the production rates of Big Oil organizations operating in California as it relates to air pollution since the expansion of cap-and-trade to include oil. A clear picture of Big Oil's macro productivity rates will provide the best indication of the success of cap-and-trade as it relates to limiting pollution. The number of total companies polluting in California was extracted from the Toxic Release Inventory (TRI), a publicly-available EPA database that contains information on the release of toxic chemicals into the atmosphere and the waste management concentration activities reported annually by certain industries as well as federal facilities (EPA, 2010).

In order to ascertain the companies that constitute "Big Oil", the top 10 California-based oil companies by million metric tons of carbon dioxide equivalent (Zalloum, 2007; Nussbaum 2016) were selected from the "facility name" column (column AD) as well as the "parent company name" column (column DD) since there were multiple locations for most of the companies. Table 2 lists the number of companies determined to be "Big Oil" for purposes of this study. No companies with the word "refinery" in their name were included in the sample set.

TABLE 1. Number of Production Organizations Emitting Toxic Chemicals in California, by year

2009	4,001
2010	3,933
2011	3,872
2012	3,923
2013	3,913
2014	3,901
2015	3,813
2016	3,657

TABLE 2. California Organizations whose Facility Name or Parent Company Name includes "oil"

2009	406
2010	406
2011	358
2012	393
2013	394
2014	386
2015	330
2016	313

This study wished to analyze composite air pollution. Providing assistance in this analysis was Nathan Byers, from the Office of Pollution Prevention and Technical Assistance at the Indiana Department of Environmental Management, defined fugitive air emissions as "all releases to air that are not released through a confined air stream including equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems, from Section 5.1 on the TRI Form R" (personal communication, 2010).

In order to compare apples to apples for air emissions, Byers suggested combining columns: "This will be taking into account what is leaving the facility via air no matter what the process is. In this way, you can fairly compare facilities in one industry to facilities in another" (personal communication, 2010). He indicated that the "Total Air Emissions" column was the combination of types of air leaving a facility. As such, "Total Fugitive Air Emissions" and "Stack Air Emissions" were added for purposes to create the "Total Air Emissions" (Tanoos, 2012), as seen in Table 3 below.

TABLE 3. Total Air Emissions of the Sample Set of "Big Oil" organizations, by year

Oil	California
2009	895652.1
2010	944339.4
2011	86757.01
2012	919892.4
2013	918985.3
2014	1101057
2015	1008404
2016	977465.8

Another focus of this study is the coinciding output or production rates of these organizations, Timothy Antisdel (2017), Specialist/Database Administrator for the EPA

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described how production rates can be determined. Antisdel (2017) noted that in addition to collecting air pollution rates, the EPA also "collects a production or activity index which indicates the change in production or activity at the facility from year to year", which are included in column DB. As such, average annual productivity rates (as they compare to their productivity from the prior year) for companies from Table 2 were extrapolated from the TRI. Table 4 below summarizes the average productivity rates of these organizations.

TABLE 4. Average Annual Production of the Sample Set of "Big Oil" Organizations, by year

Oil	California
2009	1.043077
2010	0.97915
2011	1.076134
2012	1.018724
2013	0.998846
2014	4.775777
2015	1.330636
2016	1.095402

In order to obtain a comparable method for assessing pollution as it relates to output, or pollution efficiency, variables for both pollution and productivity must be included. As such, the total air pollution, or the sum of the fugitive and stack air from Table 3, was utilized as the numerator and the average productivity rates from Table 4 were utilized as the denominator in order to ascertain a "pollution efficiency rate". Since the 2011 low-carbon fuel standard in a cap-and-trade styled approach was adopted in 2009 but officially took effect in 2011, analysis of pollution efficiency rates compared that from 2009-2010 versus 2011-2016.

IV. Results & Reactions

Table 5 shows the average production of the sample set of California Big Oil organizations both before and after the cap and trade policy took effect in 2011. The total production of those organizations from 2011-2016 increased from 1.01 to 1.08 compared to the production of organizations from 2009-2010, or an increase of 7.3% from the previous period.

TABLE 5. Average Annual Production of the Sample Set of "Big Oil" Organizations, before and after pollution legislation took effect

Year	Avg. Prod'n	Comparison
2009	1.043077	
2010	0.97915	1.0111
2011	1.076134	
2012	1.018724	
2013	0.998846	
2014	0.989584	
2015	1.330636	
2016	1.095402	1.0849

Table 6 below shows the average total emissions (fugitive plus stack) of the sample set of California Big Oil organizations both before and after the legislation took effect. The total emissions of those organizations from 2011-2016 decreased from 919,996 lbs. to 835,427 lbs. compared to the emissions from 2009-2010, or a reduction of 9.2% from the previous period.

TABLE 6. Total Air Emissions of the Sample Set of "Big Oil" Organizations, before and after coal legislation took effect

Year	Emissions	Comparison
2009	895652.1	
2010	944339.4	919,996
2011	86757.01	
2012	919892.4	
2013	918985.3	
2014	1101057	
2015	1008404	
2016	977465.8	835,427

Since this study sought to utilize the "pollution efficiency rate" to ascertain production as it compares to emissions, the average production from Table 5 was divided by the total emissions from Table 6 for all companies in the sample set both before and after the respective legislation took effect, as seen in Table 7 below. As such, the pollution efficiency rate increased (got better) at a rate of 18.2% from the prior period.

TABLE 7. "Pollution Efficiency Rate", before and after legislation

Before/After	productivity/emissions
2009-2012	1.09904E-06
2013-2016	1.2986E-06

Big Oil companies operating in California had to make some changes to their organizational models since the state added cap-and-trade to its oil organizations. This study founded that since the legislation took effect, production increased sharply as emissions decreased slightly. These factors contributed to a notable increase in the pollution efficiency rate.

While these macro-economic trends in California look promising for the future of Big Oil, future studies should analyze these statistics in additional sectors from January 1, 2015, when industrial energy sources such as gasoline, diesel and natural gas were added under the cap-and-trade program in California additional areas of the oil industry became subject to these regulatory constraints.

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